REMARKS

Status of the Application:

Claims 1–37 are the claims of record of the application. Claims 1-3, 5-16, 18-26, and 28-37 have been rejected, and claims 3, 4, 10, 16, 17, 23, 27, 33, and 34 have been objected to. Claims 4, 17, 27, and 34 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Amendment to the Claims:

Applicants have amended the claims to overcome the objection to claims 3, 10, 16, 23, and 33. Applicants also have amended the medium claims to recite a computer-readable medium with machine readable and executable instructions encoded thereon, the instructions when executed by one or more processors of a processing system causing carrying out a method comprising the steps recited. Applicants also have amended claim 26 to change the dependency of the claim. This was a clerical error; the claim was written to be dependent on claim 25.

Applicants also have amended the claims to emphasize that Applicants' methods and apparatuses are for **real time** resampling, and that such resampling can be **upscaling or downscaling** to make clearer some differences of the invention to the prior art.

Applicants also have amended the claims that were deemed to contain allowable subject matter so that such claims are in independent form in a condition of allowance.

Claim Objections

Claims 3, 10, 16, 23, and 33 were objected to because of the informality that the "line scan data set" was missing after "accepted." Applicants have amended the claims to correct this informality.

Claim Rejections -35 USC § 112 Second Para. (Indefiniteness)

Claim 26 was rejected under 35 USC 112, second paragraph, as being indefinite. Applicants have amended the claim to correct an error; the claim is now dependent on claim 25 as originally meant. The rejection is thus believed overcome by the amendment.

Claim Rejections -35 USC § 102

Rejections over Edgar et al.

Claims 1, 2, 3, 5-16, 19-24, 29-33, 35, 36, and 37 have been rejected under 35 USC 102(b) as anticipated by Edgar et al. (U.S. Patent 5,608,538, hereinafter "Edgar").

Independent claim 1 (and other independent claims).

With respect to claim 1, Applicants have amended the claim to state that the accepting is in <u>real time,</u> that the resampling is in <u>real time</u> and is to produce <u>upsampled or downsampled</u> resampled line image data sets at a desired sampling distance, such that the resampling <u>both carries out real-time upsampling or downsamping to the desired sampling distance, and</u> adjusts <u>in real time</u> for variations in relative speed to produce faithfully exposed data <u>that is either upsampled or downsampled compared to the line scan data sets according to the relative speed and the desired sampling distance.</u>

Similar amendments have been made to independent claims 8, 14, 21, and 31.

These aspects are not taught in Edgar. In particular:

Edgar deals with small variations. There is no limit to how large the variations can be in Applicants' method and apparatus.

Edgar deals with variations at a scanner that are relatively small. See for example, Edgar col. 4, lines 25–47. These variations, by their very nature, are relatively small compared to the nominal speed of relative motion between the image sensor and the object being imaged. See, for example, the repeated use in Edgar of the terms "*error, distortion, irregular, jitter.*" See furthermore Edgar's control of a motor to maintain consistent scan speed (col. 7, lines 55–60, and col. 8, lines 13–14). Using Edgar, a lesser motor that's not that accurate may be used. Applicants' invention can deal with large variations as shown in

Applicants' Fig 5 where the variations in duration of RLN (M-1 to M+2) are clear.
Similarly Applicants' FIG. 7 shows large variations.

Applicants' method and apparatus is for real time resampling with the relative speed and camera rate not necessarily related. That is, Applicants apparatus keeps up with the data rate. Edgar, varies the relative speed to accommodate the ability to accept and/or process the data

Applicants claim 1 now includes: "resampling the line-scan data sets <u>in real time</u> to produce <u>upsampled or downsampled</u> resampled line image data sets at a desired sampling distance, **he resampling being a function of the camera rate, the measure of relative speed and the desired sampling distance**." There further is a recitation that "the resampling <u>both carries out real-time upsampling or downsamping to the desired sampling distance, and </u>adjusts <u>in real time</u> for variations in relative speed to produce faithfully exposed data <u>that is either upsampled or downsampled compared to the line scan data sets according to the relative speed and the desired sampling distance.</u>"

While Edgar suggests that the calculations are real time, Edgar inherently does not describe a real-time process. For example, Edgar describes what happens when the computer cannot keep up with the data. See, e.g., Edgar, col. 6, lines 46–59 state: "*Even when the scanner would like to send out data faster than the host is willing to receive it, the scanner just slows or stops the scanning process to accommodate the host.*" Similarly, see Edgar col. 10, lines 55–59: "*If scan lines are lost repeatedly, the motor speed is reduced to give the processor a chance to catch up. If more than one scan line is lost, the processing may be suspended and the motor reversed slightly. The processing is restarted and the motor is restarted.*" Furthermore, Edgar involves carrying out image analysis of a reference track in the spatial domain, so performs some form of image analysis on the imaged track, again suggesting non-real-time processing. In Applicants' invention, the resampling is a function of the camera rate, the measure of relative speed and the desired sampling distance. The camera rate and the relative speed are not necessarily related. The processing is in real time and can keep up with the real-time accepting of the data, unlike the case in Edgar, where the accepting is adjustable by varying the relative speed to accommodate the ability to accept and/or process the data.

It should be noted that at the time of Edgar's invention, convolvers, e.g., convolver chips made by Zoran and others that were extremely fast, even video rate, and that could carry out real time convolutions were certainly available and would be known to those in the art, e.g., to an inventor at IBM, Edgar's assignee, so that Edgar's not including real-time hardware, but rather choosing to have hardware that slows down the scanning to reduce the rate of data collection so the their computer can keep up shows that Edgar teaches away from keeping up with the data, i.e., a real-time process to keep up with the data rate, rather than a system that varies the data rate.

Applicants' application include upscaling or downscaling the data in a single direct calculation. Edgar includes pre-scaling, and is for downsamping.

Applicants claim 1 now includes: "resampling the line-scan data sets in real time to produce upsampled or downsampled resampled line image data sets at a desired sampling distance." There also is a recitation that the "resampling both carries out real-time upsampling or downsamping to the desired sampling distance, and adjusts in real time for variations in relative speed to produce faithfully exposed data that is either upsampled or downsampled compared to the line scan data sets according to the relative speed and the desired sampling distance.

Edgar teaches away from carrying out such a direct calculation. See the two paragraphs on col. 24, lines 11–34 that include "*If this were to be resized directly to the output resolution using a wide window filter, such as a sinc filter mentioned earlier, three problems are encountered that add considerably to the required computation time..... *" and "*These problems are solved in the current invention by resizing in two steps.*"

Furthermore, Edgar does not accommodate both upscaling and downscaling, but only downscaling. In particular, Edgar includes a pre-scaling step that (significantly) downscales the data. Edgar's rescaling is explained in detail in the above-referenced part of col. 24 with reference to FIG. 16.

Thus Applicants' claim 1, as amended is now believed allowable over Edgar, and allowance thereof is respectfully requested.

Independent claims 8, 14, 21, and 31 also include the limitations, and are thus allowable over Edgar.

Dependent claim 2 (and other dependent claims).

Dependent claim 2 claims that each data point in the resampled line image data set is "calculated as a weighted sum of data of the accepted line-scan data sets that are partially or completely accepted during the resampling time corresponding to the resampled line image data set, the weightings a function of the relative speed such that a first proportion of a first accepted line-scan data set is weighted less when the relative speed is slower than a second proportion of a second accepted line-scan data set corresponding to when the relative speed is faster."

As already stated for claim 1, Edgar teaches away from carrying out such a direct calculation of a weighted sum of the accepted line-scan data sets. Edgar instead teaches a two-step process. See the two paragraphs on col. 24, lines 11–34 that include *"If this were to be resized directly to the output resolution using a wide window filter, such as a sinc filter mentioned earlier, three problems are encountered that add considerably to the required computation time....."* and *"These problems are solved in the current invention by resizing in two steps."*

Furthermore, Edgar does not accommodate both upscaling and downscaling, but only downscaling. In particular, Edgar includes a pre-scaling step that (significantly) downscales the data. Edgar's rescaling is explained in detail in the above-referenced part of col. 24 with reference to FIG. 16. See in the first pre-scale process, how the original sampled are first grouped and groups are then individually weighted, that is a convolution is applied to "groups" of samples of the original data to produce (heavily) downsampled data.

Thus Applicants' claim 2, as amended is believed allowable over Edgar, and allowance thereof is respectfully requested.

Dependent claims 9, 15, 22, and 32 also include the limitation of each resampled data point calculated as a weighted sum of data of the accepted line-scan data sets ..., and are thus allowable over Edgar.

Allowance of these claims is respectfully requested.

Dependent claim 3 (and other dependent claims).

Dependent claim 3 claims how the weighting depends on overlaps in the calculation of the weighted sums. As already stated for claim 1 and 2, Edgar teaches away from carrying out such a direct calculation of a weighted sum of the accepted line-scan data sets. Edgar instead teaches a two-step process. See the two paragraphs on col. 24, lines 11–34.

Note also in Edgar's FIG. 16 Edgar's included a pre-scaling step that (significantly) downscales the data. The first pre-scale process includes the original samples first grouped and groups then individually weighted, that is a convolution is applied to "groups" of samples of the original data to produce (heavily) downsampled data. This certainly is not the same as dependent claim 3.

Thus Applicants' claim 3, as amended is believed allowable over Edgar, and allowance thereof is respectfully requested.

Dependent claims 10, 16, 23, and 33 also include the limitation of each resampled data point calculated as a weighted sum of data of the accepted line-scan data sets ..., and are thus allowable over Edgar.

Allowance of these claims is respectfully requested.

Apparatus claim 21

Claim 21 (as amended) is not taught by Edgar for the reasons stated above for the rejection of claim 1, and these arguments are incorporated into this argument for claim 21.

Furthermore, Edgar does not disclose a rate converter to accept a measure of the relative speed between the line-scan camera and the object being imaged by the line-scan

camera and produce a web-rate signal related to the accepted measure of relative speed by a scaling factor.

Edgar describes a position module, motor module and a tracking module. The motor module is used to control the speed at which the image is being scanned. If too many or too few scan lines are being scanned per time increment, the scan speed will be decreased or increased accordingly. Furthermore, in the portion cited by the office, Edgar describes the general process followed by the microcode for correcting the scanned image. However, Edgar is totally silent on the aspect of producing **a web-rate signal** related to the accepted measure of relative speed by a scaling factor. Hence, Edgar does not disclose claim 21.

The Office further suggests that Edgar discloses an interface between a computer system and the rate converter, the resampler, and image store to provide for transferring the resampled line image data sets to the computer system, and for setting the scaling factor and desired sampling distance. In Edgar, e.g., the part cited by the Office, the **original data** is transferred to a computer, and that computer carries out the two-step resampled to downscale the data. There is no interface between the resampler and a computer because the computer is Edgar's resampler. That computer, as already discussed, is sometimes not able to keep up with the required rate and forces the system to slow down. Hence, Edgar does not disclose claim 21.

Apparatus claim 25

Claim 25 was rejected under 35 U.S.C. 103(a) as being unpatentable over Edgar, US Patent 5,608,538.

The parent claim of claim 25 is allowable; hence dependent claim 25 is allowable. Edgar, furthermore, teaches away from the invention by teaching the speeding-up or slowing down of data capture according to whether the data can be accommodated, and further, teaches a two-step scaling process that inherently is downscaling. The features missing from Edgar would require substantial modification of Edgar, and is thus non-obvious. Such modification would need to include key components of Applicants' invention, including, for example, the resampler. If the proposed modification or

combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious (In re Ratti, 270 F.2d 810, 123 USPQ 349 (CCPA 1959)).

Hence the rejections under 35 USC 102 and 35 USC 103 over Edgar are overcome by the claims (as amended).

Rejections over Van Tyne et al.

Claims 1, 2, 5, 6, 8, 9, 11, 12, 14, 18, and 19 have been rejected under 35 U.S.C. 102(b) as being anticipated by US Patent 4,170,419 to Van Tyne et al. (hereinafter Van Tyne).

Claims 21, 22, 26, 28 and 29 have been rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 4,170,419 to Van Tyne et al.

Van Tyne teaches an inspection system that includes the use of an inspection head assembly (50) which contains line scan cameras (160).

However, Van Tyne fails to teach or suggest a <u>real-time</u> resampler coupled to the data conditioner and to the rate converter, the resampler to resample <u>in real-time</u> accepted line-scan data sets to produce <u>upsampled or downsampled</u> sets of resampled line image data at a desired sampling distance, the resampling a function of the camera rate, the measure of relative speed and the desired sampling distance.

Van Tyne describes an optical system for inspecting defects in a fabric web. An important aspect of Van Tyne is the generation of a reference value corresponding to reflected radiation of a predetermined area or area matrix surrounding a discrete segment of the fabric web. A preprocessor 62 differentiates a detected defect from the normal background variations found in the fabric surface by comparing the reflected radiation of a discrete segment of the web with the reflected radiation from the area matrix.

Col. 15, line 19–31 describes how a sum is calculated to represent background measurement. ("*The arithmetic function circuitry 366 includes circuitry to generate the area of matrix sum which represents the sum of the value of the five cells stored in the*

*stack memory plus four additional row sums to constitute the data from 25 different
cells.*")

**Col. 15, line 32–42 described how Van Tyne simply look at a test cell and
compares the value to the calculated sum to see if there is a defect area.** ("*The output
values of the three test cells selected from within the area utilized to calculate the area
sum are each compared to the area sum. Through this comparison of a single test cell to
the area sum of 25 cells, the determination of whether the test cell represents a defect
present within the fabric web 77 is made.*")

Col. 15, line 43–54 describes how "*The defect data is applied to the computer
interface 368, which correlates the particular defect with the yard at which the defect
occurred along the fabric web 77.*")

There is no description or suggestion in Van Tyne of a real-time resampler coupled
to the data conditioner and to the rate converter, the resampler to resample in real-time
accepted line-scan data sets to produce upsampled or downsampled sets of resampled line
image data at a desired sampling distance.

With respect to claims 21, 22, 26, 28 and 29, any modification of Van Tyne would
have to be substantial, and is thus non-obvious. Such modification would need to include
key components of Applicants' invention, including, for example, the resampler. If the
proposed modification or combination of the prior art would change the principle of
operation of the prior art invention being modified, then the teachings of the references are
not sufficient to render the claims prima facie obvious (In re Ratti, 270 F.2d 810, 123
USPQ 349 (CCPA 1959)).

For at least these reasons, the rejection of claims 1, 2, 5, 6, 8, 9, 11, 12, 14, 18, and
19 (as amended) over Van Tyne under 35 USC 102 and of claims 21, 22, 26, 28 and 29
under 35 USC 103 are believed overcome. Reversal of the rejections is respectfully
requested.

Allowable subject matter

Claims 4, 17, 27, and 34 have been deemed to include allowable subject matter and would be allowable if amended to independent form to include all of the limitations of the parent claims and any intermediate claims.

Applicants have so amended claims 4, 17, 27, and 28. The claims hence are allowable.

For these reasons, and in view of the above amendment, this application is now considered to be in condition for allowance and such action is earnestly solicited.

Conclusion

The Applicants believe all of Examiner's rejections have been overcome with respect to all remaining claims (as amended), and that the remaining claims are allowable. Action to that end is respectfully requested.

If the Examiner has any questions or comments that would advance the prosecution and allowance of this application, an email message to the undersigned at dov@inventek.com, or a telephone call to the undersigned at +1-510-547-3378 is requested.

Respectfully Submitted,

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